

## **Chapter 2. Refuge Management Direction**

### **2.1 Considerations in the Design of the CCP**

In thinking through appropriate actions for this long-term conservation plan, the planning team reviewed and considered a variety of resource, social, economic, and organizational aspects important for managing the Refuge. As is appropriate for a national wildlife refuge, resource considerations were fundamental in developing the CCP. House Report 105-106 accompanying the Improvement Act states “. . .the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first.”

Local, State, and Federal agencies and elected officials were contacted by the planning team to ascertain priorities and problems as perceived by others. The team also contacted Refuge users, nonprofit groups, and community organizations to ensure that their comments and ideas were considered during CCP development.

### **2.2 General Guidelines**

To reduce the length and redundancy of the individual objective descriptions, common elements are presented below.

#### **2.2.1 Implementation Subject to Funding Availability**

Actions will be implemented over a period of 15 years as funding becomes available. Routine maintenance, repair, replacement, and improvement of existing facilities will continue, also dependent on funding. Annual priorities will follow CCP guidelines, although funding initiatives, unforeseen management issues, and budgets may vary from year to year. The CCP will be reviewed every year and updated as necessary throughout its life.

#### **2.2.2 Interagency Coordination and Collaboration**

Ecosystem planning efforts discussed in Chapter 1, Section 1.6 involve collaboration among Federal, State, and local agencies toward mutual goals. The Service will continue to maintain regular discussions and partnership with the DLNR, and we will seek out other State and local agencies, non-profit, and private individuals. Topics for discussion continue to be the endangered waterbirds at Kakahai‘a NWR and surrounding private and public lands, wetland restoration, and wildlife monitoring. Current partners include: U.S. Geological Survey (USGS), the Nature Conservancy (TNC), Moloka‘i Invasive Species Committee (MoISC), the Natural Resource Conservation Service (NRCS) and the Moloka‘i-Lana‘i Soil and Water Conservation District.

#### **2.2.3 Threatened and Endangered Species Protection and Recovery**

Protection of threatened and endangered (T&E) species is common across all alternatives. It is Service policy to give priority consideration to the protection, enhancement, and recovery of these

species on national wildlife refuges. The protection of federally listed species is mandated through Section 7 of the ESA, called “Interagency Cooperation,” is the mechanism by which Federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. To ensure adequate protection, the Refuge is required to review all activities, programs, and projects occurring on lands and waters of the Refuge to determine if they may affect listed species. If the determination is that an action may affect an endangered species, then the Refuge conducts a formal review, known as a consultation, to identify those effects and means to mitigate those effects.

#### **2.2.4 Historic and Cultural Resource Protection**

Cultural resources on refuge lands receive protection and consideration in accordance with Federal cultural resources laws, Executive orders, and regulations, as well as policies and procedures established by the Department of the Interior (DOI) and the Service. Refuge management actions will support the State of Hawai‘i’s vision statement “to promote the use and conservation of historic and cultural resources for the education, inspiration, pleasure and enrichment of the public in a spirit of stewardship and trusteeship for future generations” (State Historic Preservation Plan 2010-2014).

The Native American Graves Protection and Repatriation Act (NAGPRA) is a Federal law passed in 1990 that provides a process for museums and Federal agencies to return certain Native American cultural items — human remains, funerary objects, sacred objects, or objects of cultural patrimony — to lineal descendants, and culturally affiliated Indian tribes and Native Hawaiian organizations. A Native Hawaiian organization includes any organization that: (a) serves and represents the interests of Native Hawaiians, (b) has as a primary and stated purpose of the provision of services to Native Hawaiians, and (c) has expertise in Native Hawaiian Affairs, and includes the Office of Hawaiian Affairs and Hui Malama i na Kupuna ‘o Hawai‘i Nei. The DOI has interpreted this definition to also include the Hawaiian island burial councils and various ‘ohana (extended families).

During early planning of any projects, the Refuge will provide the Service Regional Historic Preservation Officer (RHPO) a description and location of all projects and activities that affect ground and structures, including project requests from third parties. Information will also include any alternatives being considered. The RHPO will analyze these undertakings for potential to affect historic properties and enter into consultation with the State Historic Preservation Officer (SHPO) and other parties as appropriate. The Refuge will also ask the public and local government officials to identify any cultural resource impact concerns. This notification is generally done in conjunction with the review required by NEPA or Service regulations on compatibility of uses.

#### **2.2.5 Fire Management**

The suppression of wildfires and the use of prescribed or controlled fire are a long-standing part of resource protection, public safety, and habitat management on national wildlife refuges. The Fire Management Plan (Appendix F) provides detailed guidance for the suppression and use of prescribed fire. That plan’s actions and effects are incorporated through reference in this CCP. The plan outlines wildfire response and prescribed fire objectives, strategies, responsibilities, equipment and staffing; burn units; implementation; monitoring; and evaluation.

### **2.2.6 Participation in Planning of Regional Development Activities**

The Service will actively participate in planning and studies for ongoing and future industrial and urban development, contamination, and other potential concerns that may affect the Refuge's wildlife resources and habitats. The Service will continue to cultivate working relationships with pertinent State and Federal agencies to stay abreast of current and potential developments and will utilize effective outreach tools and technologies and EE as needed to raise awareness of the Refuge's resources. The Refuge will participate in local community initiatives to protect, steward, and enhance natural landscapes and wildlife habitat.

### **2.2.7 Adaptive Management**

Based upon 522 Departmental Manual (DM) 1 (Adaptive Management Implementation policy), Refuge staff shall utilize adaptive management for conserving, protecting, and, where appropriate, restoring lands and resources. Within 43 CFR 46.30, adaptive management is defined as a system of management practices based upon clearly identified outcomes, where monitoring evaluates whether management actions are achieving desired results (objectives). The recently published DOI Adaptive Management Technical Guide also defines adaptive management as a decision process that “promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood.”

Adaptive management accounts for the fact that complete knowledge about fish, wildlife, plants, habitats, and the ecological processes supporting them may be lacking. The role of natural variability contributing to ecological resilience also is recognized as an important principle of adaptive management. It is not a “trial and error” process, but rather emphasizes learning while doing based upon available scientific information and best professional judgment considering site-specific biotic and abiotic factors on Refuge lands. Adaptive management results in effective monitoring and evaluation of the CCP.

Part of measuring the success of and adaptively managing the Refuge also includes the formal 15-year revision of the CCP. The revision will be initiated by the Service and will involve many of the same steps as this CCP, including comprehensive review of management plans and research; working closely with partners; and engaging the public.

### **2.2.8 Integrated Pest Management**

In accordance with DOI policy 517 DM 1 and Service policy 569 FW 1, an integrated pest management (IPM) approach will be utilized, where practicable, to eradicate, control, or contain pest and invasive species (herein collectively referred to as pests) on Refuge lands. The IPM will involve using methods based upon effectiveness, cost, and minimal ecological disruption, which considers minimum potential effects to nontarget species and the refuge environment. Pesticides may be used where physical, cultural, and biological methods or combinations thereof are impractical or incapable of providing adequate control, eradication, or containment. If a pesticide will be needed on Refuge lands, the most specific chemical available for the target species will be used unless considerations of persistence or other environmental and/or biotic hazards will preclude it. In accordance with 517 DM 1, pesticide usage will be further restricted because only pesticides registered with the Environmental Protection Agency (EPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide

Act and as provided in regulations, orders, or permits issued by EPA, that it is registered for use in the State of Hawai‘i, may be applied on lands and waters under Refuge jurisdiction.

Environmental harm by pest species refers to a biologically substantial decrease in environmental quality as indicated by a variety of potential factors, including declines in native species populations or communities, degraded habitat quality or long-term habitat loss, and/or altered ecological processes. Environmental harm may be a result of direct effects of pests on native species, including preying and feeding on them; causing or vectoring diseases; preventing them from reproducing; outcompeting them for food, nutrients, light, nest sites, or other vital resources; or hybridizing with them so frequently that within a few generations, few if any truly native individuals remain. Environmental harm also can be the result of an indirect effect of pest species. For example, decreased waterfowl use may result from pest plant infestations reducing the availability and/or abundance of native wetland plants that provide forage during the winter.

Throughout the life of the CCP, most proposed pesticide uses on Refuge lands will be evaluated for potential effects to Refuge biological resources and environmental quality. Pesticide uses with appropriate and practical best management practices (BMP) for habitat management as well as facilities maintenance will be approved for use on Refuge lands where there likely will be only minor, temporary, and localized effects to species and environmental quality based upon non-exceedance of threshold values in chemical profiles. However, pesticides may be used on Refuge lands where substantial effects to species and the environment are possible (exceed threshold values) in order to protect human health and safety (e.g., mosquito-borne disease). For more information on strategies related to control of pests, see Appendix E.

## **2.2.9 National Environmental Policy Act Compliance**

Since this CCP is programmatic in many issue areas, it may not contain the necessary detail on every future action outlined to adequately present and evaluate all physical, biological and socioeconomic impacts. Thus, before certain objectives or actions are implemented, a decision will be made in coordination with the Regional NEPA Coordinator on whether separate step-down NEPA compliance (categorical exclusions, environmental assessments, or an environmental impact statement) are needed.

### **2.2.10 Law Enforcement**

#### **Officers’ Responsibilities**

Fish and wildlife law enforcement issues on lands and waters of the Kakahai‘a NWR are under the jurisdiction of the Service Zone Officer based in Honolulu. The role of the Zone Officer is to conduct and document law enforcement incidents and coordinate and/or meet with all refuge project leaders, law enforcement supervisors, and refuge officers. The Hawaiian and Pacific Islands Zone Officer is highly mobile and is frequently deployed temporarily to various areas throughout the State of Hawai‘i and across the Pacific Region. The need for a dedicated Refuge Officer for the Complex has been identified in the Implementation Plan (Appendix C).

#### **Officers’ Authority**

The Zone and Refuge Officers are primarily responsible for enforcing refuge and wildlife laws, including but not limited to the:

- Administration Act;

- Lacey Act;
- Archaeological Resources Protection Act;
- Endangered Species Act;
- Migratory Bird Treaty Act; and
- Marine Mammal Protection Act.

Zone and Refuge Officers are also empowered to enforce all criminal laws, including traffic violations, drugs, and warrants for arrest as they relate to trespass, hunting, fishing, and the taking of wildlife on Federal lands, and in some instances boating safety related to refuge lands and waters. Service Officers work joint patrols and coordinate with the State Division of Conservation and Resources Enforcement (DOCARE), Maui Police Department, and the Sheriff Division of the State Department of Public Safety.

### **2.2.11 Refuge Revenue Sharing Payments**

Annual payments to the County of Maui under the Refuge Revenue Sharing Program in lieu of property taxes will continue according to the established formula and subject to payments authorized by Congress.

### **2.2.12 Regulatory Compliance**

Activities under all alternatives requiring additional review, permits and clearances (e.g., Section 106 of the National Historic Preservation Act, ESA Section 7 endangered species consultation, 401 water quality permits, etc.) will undergo appropriate review and obtain permits and/or clearances as needed.

### **2.2.13 Volunteer Opportunities**

Volunteer opportunities occur in all alternatives. These are recognized as components of the successful management of public lands and may become vital to the implementation of refuge programs, plans, and projects, especially in times of declining budgets. Currently, the Refuge hosts intermittent volunteer projects with 40 volunteers.

### **2.2.14 Climate Change**

Climate change is expected to place enormous pressure on coastal refuges particularly vulnerable to sea level rise (SLR) resulting from melting glaciers and thermal expansion of oceans. Estimates by the Intergovernmental Panel on Climate Change (IPCC) project that global sea level will rise 0.6-2 feet by the end of the century. This threatens to erode shorelines, inundate low-lying areas, and contaminate freshwater resources through saltwater intrusion. Other impacts of climate change include species' range shifts, phenological changes, decoupling of species assemblages, hydrological changes, and changes in disturbance regimes. Such impacts could result in dramatically different ecosystem compositions than currently exist on the refuges, and planning decisions will consider this issue.

There is overwhelming scientific consensus that the earth's climate is rapidly changing and that the primary cause of global warming is human-caused increases in greenhouse gas emissions. Much less

is understood about the complex effects that a rapidly changing climate will have on ecosystems and wildlife. The Service is participating in the Pacific Islands Climate Change Cooperative (PICCC) to develop protocols for monitoring the status and trends of fish, wildlife, and plants in relation to climate changes. A collaborative program throughout the region will best equip stakeholders to discern changes in abundance or distribution of indicator species. Because regional data accumulation and analysis is requisite, we will coordinate efforts with other Federal agencies, State agencies, conservation organizations, universities, local landowners, and climate change scientists. Such coordinated studies and monitoring data benefit our understanding and appropriate response to changes throughout the region.

## **2.3 Summary of CCP Actions**

As funding and staffing levels permit, we will restore the 15-acre Old Pond and 5.5 acres of New Pond. Physical restoration of the Old Pond will include: removal of California bulrush and other aggressive pest species, dredging accumulated sediment, reconfiguring bathymetry and radial levees, reconstructing perimeter levees, replacing the water control structure, and replacing the pump between the two ponds. Restoration of Old Pond will provide open water and emergent habitat for breeding, foraging, and nesting ‘alae ke‘oke‘o with minimum supplemental water due to the presence of natural groundwater springs.

Management actions include a compilation of available data on the ecology of the wetlands and initiation of research to evaluate the geomorphology, hydrology, and elevation in preparation for a restoration design that would meet the needs of two focal species: ae‘o and ‘alae ke‘oke‘o. A new well, pump, water distribution line, and control outlet for New Pond will be constructed and existing levees will be reconstructed. The capability of flooding and dewatering the ponds will provide permanent and seasonal habitat for ae‘o and ‘alae ke‘oke‘o, and indirectly benefit migratory waterbirds. All monitoring activities would resume with the presence of wetland function. If feasible, a predator-proof fence will be installed to minimize or eliminate predators from entering the wetlands.

The Service will work with the Hawai‘i Department of Transportation (HDOT) on planning and design to modify the culvert passing under Kamehameha V Highway to allow water from the upper watershed and periodic dewatering of the wetlands to flow to the ocean naturally without blockage from sand. We will contract a comprehensive archaeological and cultural investigation for the Refuge and surrounding lands prior to expanding restoration efforts beyond previously disturbed lands.

Maintaining the wetlands at Kakahai‘a NWR will require a regular on-site staff presence. The opportunities for visitors to engage in wildlife-dependent recreation may expand depending on staffing, and, at a minimum, a kiosk will be constructed on the earthen platform along the Refuge entrance road. Volunteer groups will be coordinated to assist staff with restoration and maintenance activities.

Table 2.1.

Kakahai‘a NWR Management Summary		
Key Themes	Objectives	Target Acreage Restored and Management Actions
HABITATS	1.1 Seasonal wetland habitat for ae‘o	5.5-7 acres
	1.2 Permanent wetland habitat for ‘alae ke‘oke‘o	14 acres
	2.1 Coastal strand	2 acres
	2.2 Grassland	2.3 acres
	3.1 Dry forest	7 acres
SCIENTIFIC DATA	4.1 Conduct inventory and monitoring	Monitor nesting success; impacts of pest plants & animals; water quantity and quality; and abundance of endangered waterbirds
	4.2 Conduct research projects	Study most effective IPM strategies; climate change research projects
	4.3 Conduct scientific assessments	Assess water resources, assess bathymetric configurations; develop climate change assessment protocols; evaluate SLAMM analyses; and conduct comprehensive cultural resource survey
VISITOR SERVICES	5.1 Wildlife observation and photography	Up to 500 visitors/year
	5.2 Interpretation, outreach, partnerships, and volunteer programs	Up to 10 programs/year
	6.1 Expand EE partnerships	5-12 programs/year

## 2.4 Kakahai‘a NWR Management

Goals and objectives are the unifying elements for successful, adaptive refuge management. They identify and focus management priorities, resolve issues, and link to refuge purpose(s), Service policy, and the Refuge System mission. The goals for the Kakahai‘a NWR are presented on the following pages. Each goal is followed by one or more objectives that pertain to it. The goal order does not imply any priority in this CCP. Some objectives pertain to multiple goals and have simply been placed in the most reasonable spot. Similarly, some strategies pertain to multiple objectives and for clarity these strategies are listed under each relevant objective.



*‘Alae ke ‘oke‘o nest USFWS*

Following the goals, objectives, and strategies, a brief rationale is provided. This rationale generally describes how management strategies will be implemented to achieve the intended objectives. The rationale may also, where necessary, discuss means to minimize potential impacts to nontarget species and habitats. It also provides further background information pertaining to the importance of an objective relative to legal mandates for managing units of the Refuge System, including refuge purpose, trust resource responsibilities (federally listed threatened and endangered species and migratory birds), and maintaining/restoring biological integrity, diversity, and environmental health.



## 2.4.1 GOAL 1.

### **Restore and maintain seasonal and permanent wetland habitats to meet the life history needs of endangered Hawaiian waterbirds.**

<b>Objective 1.1: Restore and maintain seasonal wetland habitat for ae'o.</b>
<p>Restore and maintain 5.5 acres of seasonal wetland habitat for ae'o throughout the year in New Pond with the following characteristics:</p> <ul style="list-style-type: none"> <li>• A mix of saturated and dry mudflat with small, low islands with dimensions of at least 30 ft diameter and 5:1 side slopes;</li> <li>• 75% of the bottom with undulating, irregular topography that creates exposed unsaturated substrate (e.g., shoreline, islands) with gradual slopes during drawdown for nesting sites adjacent to foraging habitat;</li> <li>• Levees with 4:1 slopes to provide loafing and foraging habitat;</li> <li>• Open water (&lt;4-6 in. depth) and mudflat (saturated and unsaturated) with &lt;30% cover of vegetation (e.g., sprangletop, kaluhā, makaloa) as a mosaic to provide protection from wind and adequate foraging areas;</li> <li>• 80% water coverage for breeding ae'o;</li> <li>• Predation of less than 1% of ae'o adults documented per year, to achieve nest success of 70% or greater;</li> <li>• &lt;10% pest plants (California bulrush, California grass, and Indian marsh fleabane);</li> <li>• No tilapia present;</li> <li>• Abundant aquatic invertebrates with densities of 400-600 invertebrates/yd<sup>2</sup>; and</li> <li>• No human disturbance during ae'o breeding season (April-July).</li> </ul>
<b>Strategies for Achieving the Objective</b>
Control pest plants using mowing, brush cutting, excavation, water level management, prescribed fire, and herbicides (see IPM, Appendix E)
Propagate and plant native species to establish natural vegetative cover on pond levees and slopes
Use IPM techniques to promote a mosaic of vegetation/open water
Develop wetland restoration plan and design
Construct water source (well, pump, water distribution line) for supplemental flooding by 2014
Pulse water during flooding, drawdown, and nonbreeding season to promote abundance and availability of invertebrates
Allow periodic dewatering from September-December to recycle nutrients and promote invertebrate abundance and diversity
Control predators using spring traps, bait stations, and water level management
Eliminate visitor access to nesting areas during breeding activity
Use heavy equipment to rebuild levees (4:1 slopes) by 2015
Use heavy equipment to form and maintain islands by 2015
Replace New Pond water control structures by 2015
Install new piezometers by 2013
Slow drawdown of water to eliminate fish and promote invertebrate/algal growth and plant response
Station employee (Maintenance Worker or Biologist) at Kakahai'a NWR to oversee Refuge programs by 2014

### ***Rationale***

Originally, New Pond was flooded from water pumped from Old Pond; however, the encroachment of California bulrush throughout Old Pond has resulted in an unavailability of water. Construction of a well and installation of a pump with electrical service is needed to provide forage, resting, and nesting habitat as well as use water level to control pest plants and promote invertebrate diversity and abundance. Ae'o require different loafing and foraging habitats during the breeding and nonbreeding seasons. Recently hatched chicks (less than 14 days old) require shallow water of less than 2 inches to forage. During the remainder of the year, fledglings and adults can forage in water as deep as 6 inches.

Seasonally regulating water depth stimulates germination of desirable and beneficial plant species, controls pest plants, and provides a variety of macroinvertebrates for young and adult ae'o to feed upon, thereby creating and maintaining maximized production and carrying capacity of the wetlands. In addition to providing forage, seasonally regulated water depths provide a mosaic of open water and vegetation as microhabitat for thermoregulation. Dewatering the pond during nonbreeding season is beneficial for recycling nutrients and allowing staff to perform IPM (herbicide and mechanical treatment) before flooding. This drying cycle enhances soil aeration and invertebrate productivity. Invertebrates are the primary food source for waterbirds but labor intensive to monitor. Random sampling and subsampling of sieved invertebrates will provide densities of species composition and abundance, and response to IPM techniques.

Management techniques including, mowing, herbicide application, prescribed fire, rototilling and water level management are all techniques suitable for creating the desired mosaic of vegetation, open water, and mudflats. These practices also benefit a variety of other wetland-dependent species including 'alae ke'oke'o, wintering waterfowl (dabbling ducks), and shorebirds. The pond would be flooded from a groundwater well or from Old Pond, and ocean water is not likely to inundate the pond.

Declining water levels increase areas of suitable nesting habitat. Ae'o breeding season drawdowns maximize the number of nests that an area can support. The target distance between nest site to vegetation and water is approximately 0-20 feet. These slow breeding season drawdown rates also stimulate ample numbers and diversity of invertebrates throughout the brood rearing period, allowing adults with broods to establish feeding territories and reduce inter-brood conflicts that can result in injury or death to young chicks.

Ae'o are very easily disturbed during the nesting season. One behavior of the adult is to depart the nest when perceived danger is detected, leaving the nest, eggs, or young exposed to ground or avian predators and the weather. Eggs can also be destroyed by prolonged exposure to high temperature, wind chill, and rain, all of which occur frequently in Hawai'i. Human disturbance must be minimized during the nesting period to reduce the risk of nest abandonment.

Ae'o nests, eggs, and young are vulnerable to a variety of predators including rats, mongooses, dogs, cats, cattle egrets, and 'auku'u. It is critical to control predators during the nesting season, thereby increasing nesting and fledging success. During this period, control will include two layers of perimeter trapping at a maximum distance of 218 yards apart, with traps placed 109 yards apart, or less. Predator control during the nonbreeding season is reliant on available staff (permanent or contracted) to monitor the program; therefore, trapping effort will be minimal (live traps and bait stations) along the perimeter of the ponds.

**Objective 1.2: Restore and maintain permanent wetland habitat for 'alae ke'oke'o.**

Restore and manage 15 acres of permanent wetland habitat for loafing and foraging 'alae ke'oke'o in Old Pond throughout the year with the following characteristics:

- Low native, vegetation cover (<4 in) on levees for foraging and loafing;
- Abundant aquatic invertebrates with densities of 400-600 invertebrates/yd<sup>2</sup> ;
- <50 ft. width of emergent vegetation along shorelines;
- Open water (<18 in.) and/or mudflat interspersed with 30-60% cover of emergent vegetation and algae that provides seeds and green browse, concealment, and thermal cover;
- 20 ft. of open water between levees and emergent vegetation to protect nests from predation;
- 4:1 slope on levees;
- >90% reduction of marsh fleabane, California bulrush, and California grass;
- 50:50 percentage of open water to emergent vegetation;
- Extended hydro periods to promote epiphytic invertebrates (e.g., dragonflies);
- <25% cover of annual pest plants;
- Documented predation level of less than 1% 'alae ke'oke'o annually;
- Brood rearing within 150 ft. from nesting habitat ;
- Stable water levels (1.0-2.5 ft. depth) during 'alae ke'oke'o laying and incubation (December-April); and
- No human disturbance during nesting season.

**Strategies Applied to Achieve Objectives**

Prepare restoration plan for Old Pond with engineering specifications and estimated costs by 2013
Clear vegetation and maintain open water around staff gages and piezometers
Implement partial to complete access closures on levees to minimize human disturbance during breeding season
Use IPM strategies including mechanical/physical, water levels, prescribed fire, chemical, and biological to control pest plants (Appendix E)
Identify methods to isolate groundwater springs
Implement predator controls including spring traps, bait stations, shooting, vegetation management, and water level management
Repair and maintain boundary fence and wetland perimeter fence
Install predator-proof fence along perimeter of ponds by 2016
Remove interior levees and accumulated sediment in Old Pond and recontour pond bottom to create microtopography for varying water level conditions by 2015
Remove pest plant species from levees and restore elevation, width, and slopes by 2015
Replace Old Pond water control structures by 2015
Install additional piezometers to monitor groundwater levels by 2013
Install water level recorder in Old Pond by 2015
Replace pump between Old and New Ponds, if feasible, by 2015
Propagate and plant native species on levees, levee slopes, and within ponds for erosion control and forage
Periodic dewatering areas of the pond to recycle nutrients, aerate soil, manage vegetation, and stimulate invertebrate response
Design and construct sediment basin along north boundary to minimize sedimentation entering the ponds by 2014

### ***Rationale***

Natural weather patterns, runoff, and subsurface ground water movement control the hydrology of the wetlands. Old Pond is naturally fed by groundwater springs resulting in a permanent hydrological unit. This natural watering is advantageous in that pumping is not required; however, California bulrush has become well established and currently covers more than 90 percent of the pond. The pond currently has no open water available to 'ālae ke'oke'o. Restoration of Old Pond for endangered and migratory waterbirds needs to incorporate an evaluation of the groundwater aquifer, topography, geotechnical data, and identification of methods to isolate the springs (e.g., temporary cofferdams) to allow the enclosed area to be pumped out, creating a dry work environment for the major work to proceed. The levees extending into the pond (radials) produce exposed areas where dryland species (e.g., kiawe, monkeypod, and Indian marsh fleabane) have become established. These radial levees need to be removed to improve the function of the wetland.

The ideal wetland, a mosaic of open water and native vegetation, provides thermoregulation cover during periods of high wind and rain, as well as increasing pair bond and brood rearing habitat. Where possible, drawdown of water will promote growth of native sedges and invertebrates. Eradicating California bulrush and obtaining water control will result in proper management of the soils to enhance macro and other aquatic invertebrate production.

Low vegetation on levees creates important habitat for 'ālae ke'oke'o as well as other species. Maintaining vegetation height of less than 4 inches provides foraging areas where 'ālae ke'oke'o can graze on short grass and feed on associated invertebrates. Levees are used as loafing habitat by shorebirds. Planting of native vegetation along levee slopes also prevents erosion and provides nesting structure and visual obscurity for nest territories.

A diversity of wetland habitats are beneficial for 'ālae ke'oke'o during the nonbreeding season, from saturated mudflats to emergent wetlands where birds can forage on seeds and seek cover. 'Ālae ke'oke'o are primarily herbivores, but opportunistically forage on epiphytic invertebrates, especially during egg laying and early growth (chick) stages. When preparing the pond for nesting, water levels are maintained at a constant level to provide adequate nest sites that are secure from predation. Fluctuating water levels would require nesting adults to continually expend energy to build the nest up or have it isolated on dry ground and subject to greater predation.

During brood-rearing periods, however, water levels would be pulsed to provide physical barriers between brood territories and stimulate macroinvertebrates that are eaten by adults in breeding condition and also fed to developing chicks. These invertebrates are an important protein source for proper development. Water levels are managed to help achieve a ratio of 50:50 vegetation to open water. Providing a mosaic of open water and desirable plant species promotes the greatest number of nesting and brood-rearing territories, while minimizing intraspecific strife between family units. It is important to maintain restricted access to minimize human disturbance during the nesting period. This includes visits from the general public, tours/educational groups, and Refuge staff.

## 2.4.2 GOAL 2.

### Protect, restore, and manage coastal habitat for the integrity of the fragile ecosystem.

Objective 2.1: Protect and maintain ocean shoreline habitat.
First restore and thereafter maintain 2 acres of the ocean shoreline habitat along Kamehameha V Highway. Implement methods to protect the coastal strand from further erosion to provide a protective barrier to the Refuge wetlands and highway. The coastal strand will be restored and maintained for the following characteristics: <ul style="list-style-type: none"> <li>• Patchy distribution of low growing (2-8 in), native woody species (e.g., ‘ilima, naupaka kahakai, and pilo) as a mosaic to naturally construct a dune system;</li> <li>• 30-40% cover of native grasses (e.g., ‘aki‘aki) and herbaceous vegetation (e.g., ‘akulikuli and kīpūkai) along shoreline;</li> <li>• &lt;25% of woody pest plant species (e.g., Indian marsh fleabane, kiawe, and koa haole); and</li> <li>• &lt;70% cover of herbaceous pest plant species (saltbush) and grasses (buffel grass, swollen finger grass).</li> </ul>
Strategies Applied to Achieve Objectives
Install signs referencing regulations prohibiting removal of sand from shoreline by 2012
Use appropriate IPM techniques to eradicate pest plant species that would not result in additional erosion
Plant native coastal species to ameliorate erosion
Install temporary sand fencing to facilitate restoration of impacted shoreline by 2013
Consult with coastal specialists on the future impacts of climate change

#### ***Rationale***

Management of Kakahai‘a NWRs coastal property is a collaborative effort with the County of Maui and has been managed as a park since the Refuge’s establishment in 1976. Nonnative grasses, kiawe trees, coconut trees, and marsh fleabane are currently maintaining the integrity of the soils/sand. Removing all of these established (rooted) plants from the coast without immediate replacement would be detrimental to the integrity of this site. Additional planting of native species along the beach will protect the existing area and provide structure upon which sand can build.

Coastal dune communities are important to several rare and endangered plant and (potentially) animal species. Coastal dunes are also fragile and easily altered by human activity. Coastal strand habitat also provides foraging and loafing habitat for migratory bird species such as the ‘ulili (wandering tattler), kōlea (Pacific golden plover), hunakai (sanderling), and ‘akekeke (ruddy turnstone). Given the soil texture, relative position to the shoreline, and desirable plant species; the strand provides suitable subterranean nest burrow habitat for ‘ua‘u kani. The coastal strand habitat at Kakahai‘a may also be suitable for ‘ilio-holo-i-ka‘uaua pupping and rearing and by honu ‘ea (hawksbill sea turtle) and honu (Hawaiian green turtle) for laying eggs and basking.

**Objective 2.2: Restore and maintain coastal grassland habitat.**

First restore and thereafter maintain 2.3 acres of grassland habitat along both sides of the entrance road on the west side of the Refuge with the following characteristics:

- Patchy distribution of low growing (2-8 in), native woody species (e.g., 'ilima and pilo);
- 30-40% cover of native grasses (e.g., 'aki'aki and pili);
- <25% of woody pest plant species (e.g., Indian marsh fleabane, kiawe, and koa haole); and
- <70% cover of herbaceous pest plant species (e.g., saltbush) and grasses (buffel grass, swollen finger grass).

**Strategies Applied to Achieve Objectives**

Remove/control pest plant species by 2013

Plant native species

Implement native hydroseeding and/or hydromulching project, if feasible, by 2014

***Rationale***

The dominant grass in Hawai'i prior to nonnative grasses was probably pili. 'Aki'aki grass is salt-tolerant and can be grown adjacent to the beach and for roads that use nonpotable water, which tends to have higher salinity in Hawai'i (pers. comm. Chris Dacus). Hydroseeding can be significantly less expensive than hand planting. HDOT has provided grant funding for University of Hawai'i Professor Joe DeFrank for native hydroseed experiments, currently underway at other locations on the Island. There is potential for a future collaboration opportunity at the Refuge.

Restoration of native grassland plants within the fenced area of the Refuge will benefit 'alae ke'oke'o that graze on grass adjacent to wetlands.

## 2.4.3 GOAL 3.

### **Protect, restore, and manage forest habitat to provide a buffer from upper watershed impacts.**

**Objective 3.1: Restore and maintain native dry forest habitat.**

Restore and maintain native dry forest habitat with the following characteristics:

- 50 ft width of trees around ponds to protect from upper watershed impacts;
- >40% native plants consistent with historic dry forest habitats; and
- <60% pest plants and annual grasses.

**Strategies Applied to Achieve Objectives**

Maintain 50 ft buffer zone of kiawe trees around ponds until replacement with native plants is feasible

Use IPM techniques to control/eradicate pest plants in buffer zone

Develop/implement restoration program, to include outplanting of native species by 2016

***Rationale***

Much of the Refuge is currently covered with pest trees and shrubs which provide a buffer from the upper watershed (e.g., slows down water and allows groundwater seepage, filters sediments and pollutants before entering the ponds). This area is dominated by dense stands of nonnative kiawe and haole koa trees. The seed dispersal from these nonnative pest species does have a negative impact on the wetland habitat. While native plants are desirable, the existing vegetation provides a buffer to shield endangered waterbird habitats from urban disturbances. Suspended

sediments in stream flows from the upper watershed primarily derive from urban development and settle in the Refuge wetlands.

One of the most significant influences leading to the degradation and loss of native Hawaiian habitats has been the relentless influx of pest plants, many of these highly invasive. The Refuge plans to work with partners to gradually restore a viable natural native plant community through removal of pest plants and outplanting of native plants that were part of the historic vegetative community.

#### 2.4.4 GOAL 4.

### Gather scientific information in support of adaptive management decisions on the Refuge under Goals 1-3.

**Objective 4.1: Conduct inventory, monitoring, and research to document progress and evaluate management strategies to guide management decisions.**

Conduct high-priority inventory and monitoring activities that evaluate resource management and public use activities to facilitate adaptive management. These surveys contribute to the enhancement, protection, use, preservation, and management of wildlife populations and their habitats on- and off-refuge. Specifically, they can be used to evaluate achievement of resource management objectives identified in this CCP. These surveys have the following attributes:

- Data collection techniques would have zero to minimal animal mortality or disturbance and zero to minimal habitat destruction;
- Collect minimum number of samples (i.e., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates) to meet statistical analysis requirements for identification and/or experimentation in order to minimize long-term or cumulative impacts;
- Use proper cleaning of investigator equipment and clothing as well as quarantine methods, where necessary, to minimize the potential spread or introduction of pest species; and
- Projects will adhere to scientifically defensible protocols for data collection, where available and applicable.

The following is a prioritized list of survey activities to support resource management decisions on the Refuge

Monitor water quantity (surface water and groundwater)

Identify the primary sources of sediment loads and solutions to minimize accumulation at lower elevations

Identify the sources of water entering the Refuge and mechanisms to enhance water quantity

Inventory and monitor bird abundance with monthly census to obtain descriptive statistics of counts and trends

Monitor breeding 'alae ke'oke'o from December-March for reproductive success (incubation period is 25 days-requires on-site staff)

Monitor breeding ae'o from April-July for reproductive success (requires on-site staff)

Research potential for hydroseeding/mulching native grasses

Monitor vegetation response to IPM techniques

Monitor mongoose and rat abundance with tracking tunnel surveys at least every 60-90 days

Conduct studies to determine desirable native plant community based on local site conditions (e.g., soil type, elevation, groundwater table, and proximity to shore)



Prioritized list of survey activities (continued)
Contract a comprehensive archaeological and cultural investigation for the Refuge and surrounding lands
Monitor human activities at the coastal park for potential effects that jeopardize the integrity of the coastal strand (e.g., erosion)
Monitor banded ae‘o and ‘alae ke‘oke‘o
Monitor water quality (abiotic parameters: pH, temperature, salinity, conductivity, turbidity, dissolved O <sub>2</sub> )
Maintain and monitor weather station

***Rationale***

The Administration Act requires us to “... monitor the status and trends of fish, wildlife, and plants in each refuge.” Surveys are used primarily to evaluate resource response to assess progress toward achieving Refuge management objectives derived from the Refuge System mission, refuge purpose(s), and maintenance of biological integrity, diversity, and environmental health. Determining resource status and evaluating progress toward achieving objectives is essential to implementing adaptive management on DOI lands as required by policy (522 DM 1). Specifically, results of surveys would be used to refine management strategies, where necessary, over time in order to achieve resource objectives. Surveys would provide the best available scientific information to promote transparent decisionmaking processes for resource management over time on Refuge lands.

Inventory, monitoring, and research studies are essential to high-quality habitat and population management. Conducting censuses for endangered waterbirds and compiling data is critical to evaluate population status and measure progress towards goals. Similarly, other waterbird populations, habitat conditions and habitat management practices, including restoration efforts must be monitored to evaluate their status and effectiveness. Population trends can be used to evaluate habitat effectiveness and guide management actions.

Refuges must collect site-specific information and conduct defensible research to provide information for devising, guiding and adapting management practices. Monitoring habitat conditions provides valuable support and sound decisionmaking as applied to Refuge resource management and also contributes to the Service’s ability to modify management practices (adaptive management). Applied research on the Refuge will help address management issues and questions, in theory, will result in improved management decisions on both the Refuge and on a regional basis. The Refuge has always maintained a close working relationship with several State and local agencies, and universities to advance the knowledge base of a variety of habitats and plant and wildlife species.

Kakahai‘a NWR is bisected by Kamehameha V Highway resulting in a coastal area set apart from the wetlands. This area is not fenced and is accessible to the public. Use of this area includes: picnicking (currently two concrete picnic tables) and access to the ocean for kayaking and fishing. Human activities in the coastal area will be monitored to ensure the impacts are not detrimental to the habitat (e.g., erosion, vandalism).



**Objective 4.2: Conduct scientific assessments.**

Throughout the life of the CCP, conduct scientific assessments to provide baseline information to expand knowledge regarding the status of Refuge resources to better inform resource management decisions. These scientific assessments will contribute to the development of Refuge resource objectives and they would also be used to facilitate habitat restoration through selection of appropriate habitat management strategies based upon site-specific conditions.

- Utilize accepted standards, where available, for completion of assessments; and
- Scale and accuracy of assessments would appropriate for development and implementation of Refuge habitat and wildlife management actions.

**Strategies Applied to Achieve Objectives**

Coordinate with Regional Office staff to adjudicate water rights (surface and groundwater)

Complete a water resources assessment, to include natural springs

Evaluate SLAMM analyses (and other studies) for climate change planning

Conduct a full topographic survey for habitat restoration design

Analyze and evaluate sediment cores for profiling, soil composition, and characteristics

Collaborate with HDOT to evaluate, design, and reconstruct the Kamehameha V Hwy. culvert to prevent flooding and allow natural drainage from the upper watershed

Initiate sampling of invertebrates (sieve) to assess species composition and density by 2016

Investigate the pros and cons of allowing high storm surges from the ocean to periodically inundate the wetland

***Rationale***

In accordance with a policy for implementing adaptive management on DOI lands (522 DM 1), appropriate and applicable environmental assessments are necessary to determine resource status, promote learning, and evaluate progress toward achieving objectives whenever using adaptive management. These assessments would provide fundamental information about biotic (e.g., vegetation data layer) as well as abiotic processes and conditions (e.g., soils, topography) that are necessary to ensure that implementation of on-the-ground resource management achieve resource management objectives identified under Goals 1-3.

Kawela's upper watershed has undergone changes in land use over the decade with increased housing development. High volumes of suspended sediments in flood waters enter the north side of Kakahai'a NWR during winter months resulting in levee damage and sedimentation in the ponds. A comprehensive hydrological assessment at Kakahai'a NWR is needed to evaluate wetland needs. An evaluation of the groundwater source is essential since Old Pond receives its water from this source.

The culvert under Kamehameha V Highway that connects the upper watershed and pond drainages to the ocean is naturally plugged by sand due to its low elevation. This sand plug blocks the flow of water, resulting in flooding of the Refuge's road and the highway. During periods of heavy precipitation, the DOT removes the sand plug to allow drainage. Unless the highway and culvert is redesigned this flooding will continue to occur. In efforts to reach the objective of restoring Old and New Ponds for the benefit of endangered waterbirds and the need to control water levels, this issue will be a hindrance and needs to be addressed.

## 2.4.5 GOAL 5.

**Provide high-quality wildlife-dependent recreation, interpretation, and outreach opportunities to enhance public understanding, appreciation, and enjoyment of the native wildlife, natural communities, and cultural history of the Kakahai‘a NWR.**

<b>Objective 5.1: Provide opportunities for wildlife observation and photography.</b>
Provide visitors with the opportunity for self-guided wildlife observation and photography to increase their knowledge and appreciation for wetland ecosystems and endangered species. <ul style="list-style-type: none"> <li>• Focus on wetland ecology and the endangered waterbirds that rely upon these wetlands;</li> <li>• Provide viewing opportunities from outside the fence when the Refuge is unstaffed; and</li> <li>• Directly link opportunities to EE and interpretation programs.</li> </ul>
<b>Strategies Applied to Achieve Objectives</b>
Develop a Visitor Services Plan (VSP) by 2016
Install Kakahai‘a NWR entrance sign
Complete the Refuge brochure and bird species checklist
Replace two Refuge signs at the coastal property in collaboration with County of Maui (Kakahai‘a Park)
Construct elevated platform (earthen) and kiosk along Refuge entrance road for wildlife viewing
Construct parking area along entrance road for kiosk
Design interpretive panels for kiosk
Open Refuge to the public when staff is present
Evaluate the need, location, and logistics for photo blinds on/adjacent to the ponds.

### ***Rationale***

Currently, Kakahai‘a NWR is unstaffed and closed to the public. Refuge staff (1-2 people) make day trips from Maui every other week to perform habitat management activities. In past years, endangered Hawaiian waterbirds and migratory species were prevalent in the wetlands. Future public use is contingent on the level of habitat restoration that is completed because without the wetlands and presence of waterbirds, there is no viewing opportunity.

A step-down VSP is needed to evaluate the existing and potential public uses on the Refuge. As part of the VSP, a viewing area and interpretive panels will be incorporated into the Kakahai‘a NWR entrance road design. During the nesting seasons for endangered ‘alae ke‘oke‘o (December-May) and ae‘o (April-August), human activities at the viewing area will be evaluated to determine whether or not waterbirds are impacted, and if disturbance is observed, the area may need to be blocked from access. Opportunities for recreational wildlife photographers at Kakahai‘a NWR will be authorized in the form of a SUP during the nonbreeding season only because staff may not be present to monitor impacts to waterbirds.

Staff oversight of the Refuge is from the headquarters located at Keālia Pond NWR on Maui. The addition of one employee (e.g., Maintenance Worker or Biologist) to work 90% of the time at Kakahai‘a NWR with duties including habitat management, predator control, and working with volunteers would facilitate oversight of proposed increases in public use.

<b>Objective 5.2: Provide interpretation, outreach, and volunteer programs.</b>
Expand the Refuge’s interpretation and outreach programs to foster appreciation and stewardship for the wetland resources and reach a wider diverse audience. Participate in partnerships and other collaborative efforts that incorporate Refuge restoration into other ecosystem-based opportunities.
<b>Strategies Applied to Achieve Objectives</b>
Maintain agreement with the County of Maui to assist with management of the coastal park
Work cooperatively with the Sedimentation Partnership
Participate in off-site community events including the annual Earth Day event on Moloka‘i, beach cleanups with Community Work Day Program, etc.
Support volunteerism through partnerships with The Nature Conservancy, AmeriCorps, and other community groups
Maintain and update the information on the Refuge website
Work with Kokua Kakahai‘a to engage new volunteers to promote and assist with the Refuge’s purpose and vision
Work with partners in the East Moloka‘i watershed to implement studies and monitoring projects
Recruit and maintain a volunteer program to assist with habitat, biological, maintenance, visitor services, and EE programs
Install and maintain panels interpreting the wetlands, waterbirds, historical and cultural information in the Kakahai‘a viewing kiosk
Incorporate Refuge interpretive information into the Maui Visitors Bureau products
Provide public presentations and interpretive tours on wetland ecology and wildlife, coastal habitats, and cultural history

### ***Rationale***

Restoration of the Refuge to a viable healthy wetland with waterbird habitat is a prerequisite to public use and volunteer programs. Many local residents are unfamiliar with Kakahai‘a NWR and do not know where the Refuge is located. The Refuge should be visible within the community to help foster support for the Refuge. Moloka‘i residents have a fairly strong volunteer ethic and they are willing to help out if they know what is available to them.

The Refuge’s support group, *Kokua Kakahai‘a*, is comprised of long-time residents with a common interest in the restoration of the wetlands. This group has provided critical support for the Refuge in the past and would be an asset to help achieve our goals in the future. The Refuge’s volunteer opportunities need to be advertised, and we should continue to participate in community events. Interpretive panels at Kakahai‘a will offer messages to viewers about the importance of wetlands and information about the wildlife that depend upon them.

## 2.4.6 GOAL 6.

### **Provide a quality environmental education program with specific learning objectives and diverse hands-on opportunities.**

<b>Objective 6.1: Provide quality environmental education (EE).</b>
Expand EE partnerships that connect children with nature and focus on the functions of wetlands and coastal ecosystems as part of watersheds. Quality curriculum includes: <ul style="list-style-type: none"> <li>• Supports national and State Department of Education (DOE) Standards;</li> <li>• Provides interdisciplinary opportunities that link natural resources through all subject areas;</li> <li>• Incorporates the Refuge System mission and Refuge purpose;</li> <li>• Involves the local community, volunteers, friends group, and partners;</li> <li>• Involves hands-on learning opportunities and stewardship components;</li> <li>• Incorporates current conservation issues and concerns; and</li> <li>• Located both on- and off-Refuge.</li> </ul>
<b>Strategies Applied to Achieve Objectives</b>
Evaluate and provide SUPs to agencies and nongovernmental organizations providing EE on the Refuge
Participate in partnerships to provide educational opportunities focusing on island ecosystems
Participate in workshops to present teachers with the tools and resources available to them on natural resource topics
Develop site-specific materials and tools for educators' use
Provide formal learning experiences in support of teachers' curricula and DOE requirements

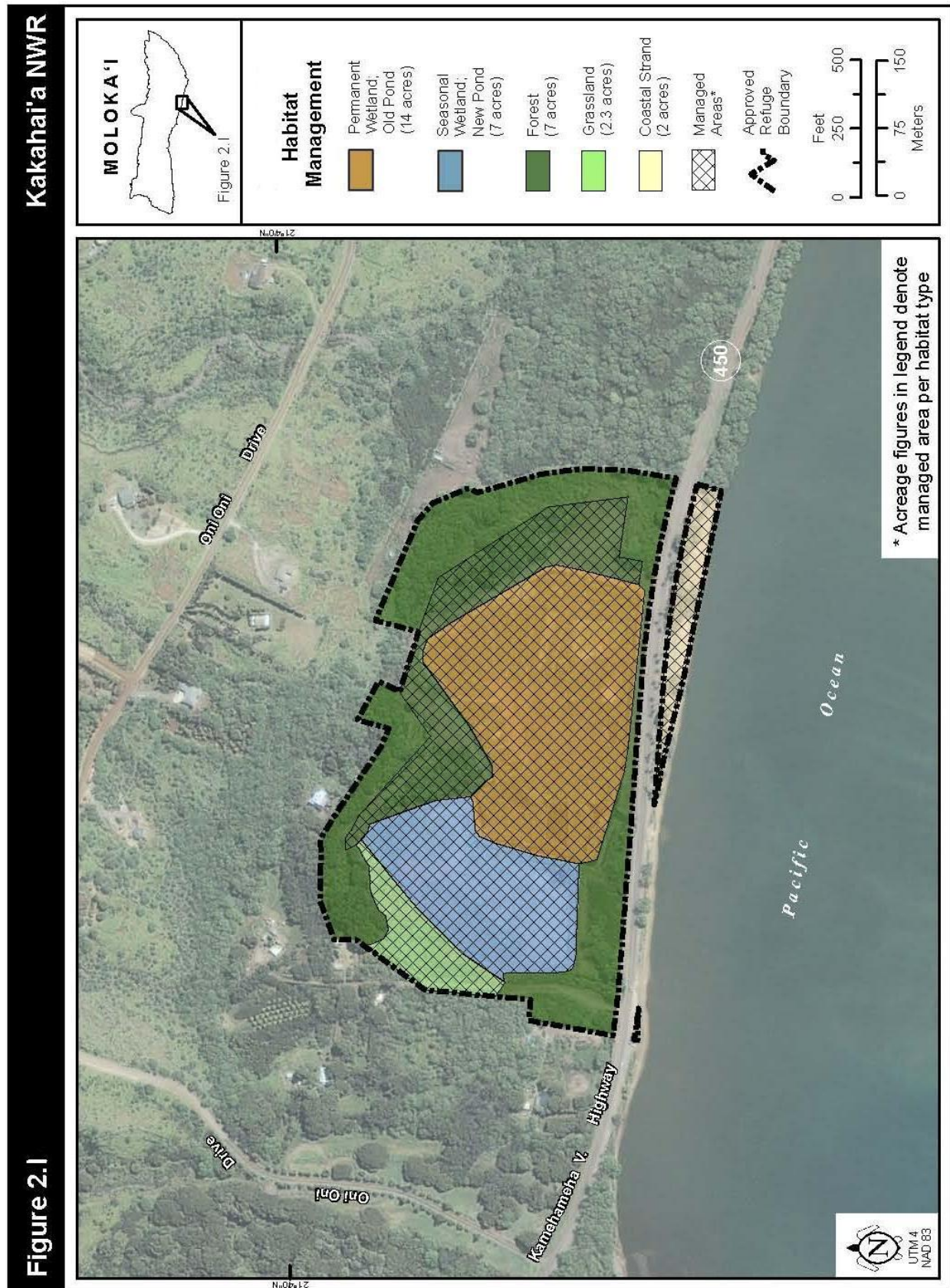
#### ***Rationale***

Many opportunities exist for us to work together with educational partners to enhance Refuge programs and also provide coordination and assistance to other local programs, with respect to watersheds and ecosystems. School groups on Moloka‘i do not have the same opportunities for diverse learning experiences as the other main Hawaiian Islands so teachers may welcome a chance to engage the students at the Refuge. Teachers may not have the time and resources to compile pre- and post-visit materials; therefore, the Refuge can provide packets geared for different age groups for teachers to incorporate the visit into their curriculum. Hands-on experiences and inclusion of career opportunities into presentations can help direct students into natural resource disciplines.

Over the past 10 years, there have been inquiries from teachers interested in accessing Kakahai‘a NWR, many of which were forwarded to our EE partners under a SUP. Currently, the primary environmental focus is on invasive species. The potential for the teachers and students to connect with nature at Kakahai‘a NWR is a feasible goal once the wetlands are restored. The Complex has limited staffing and is only able to accommodate teachers' requests on a case-by-case basis. Partnerships with EE organizations have been an effective tool to promote the Refuge System mission with outside educators who have been thoroughly trained to instruct students. Refuge staff work with partners to ensure the information is appropriate and updated.



Figure 2.1 –Habitat Management



*To preserve the quality of the map, this side was left blank intentionally.*